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Selected US specifications from IPC sub-class H01R

(54) An electrical connector and an electrical terminal

(57) An electrical connector for connecting an external electrical circuit to conductors (66) terminating in pads (67), on a circuit board (12), comprises an insulating housing (2) for mounting on the board (12), the housing containing three rows of electrical terminals (38a, 38b and 38c). Each terminal has a substantially C-shaped compliant lead (58a, 58b and 58c) terminating in a solder foot (62a, 62b and 62c) for soldering to one of the pads (67). The terminals are so dimensioned that the compliant leads are arranged in three rows spaced lengthwise of the conductors (66) and so that each of the leads engages one of the pads (67). The compliance of the leads compensates for any warping of the board (12).

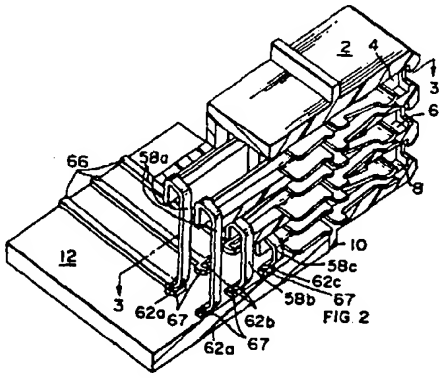


FIG 2

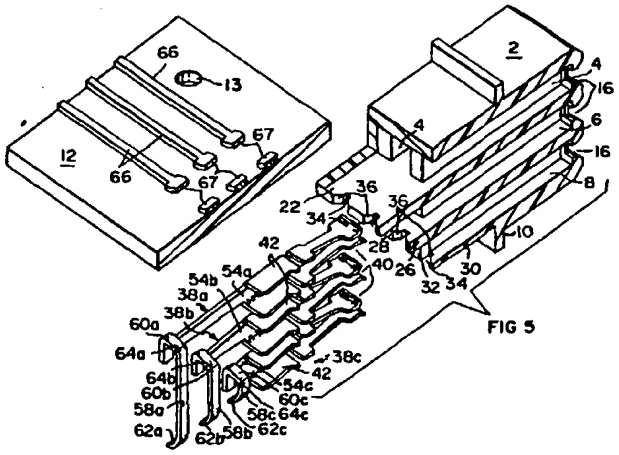
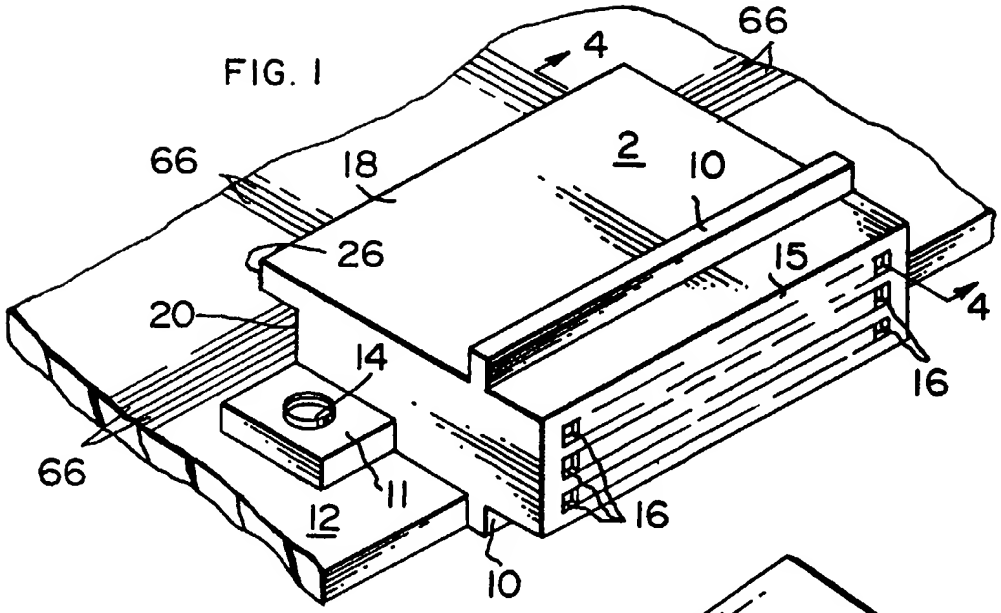


FIG 5

GB 2 168 550 A

FIG. 1


66
4
66
18
2
10
26
15
4
20
14
16
66
11
12
16
10

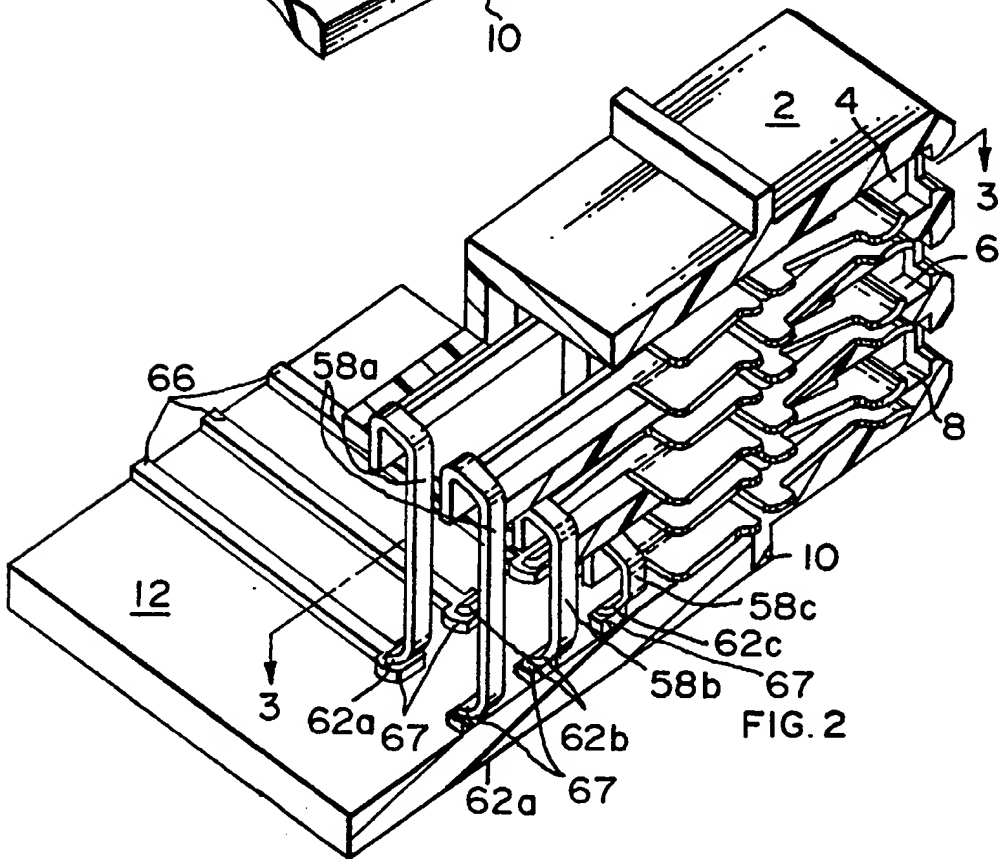

2
4
3
6
66
58a
8
10
12
58c
62c
3
62a
67
58b
67
62b
62a
67

FIG. 2

FIG. 3

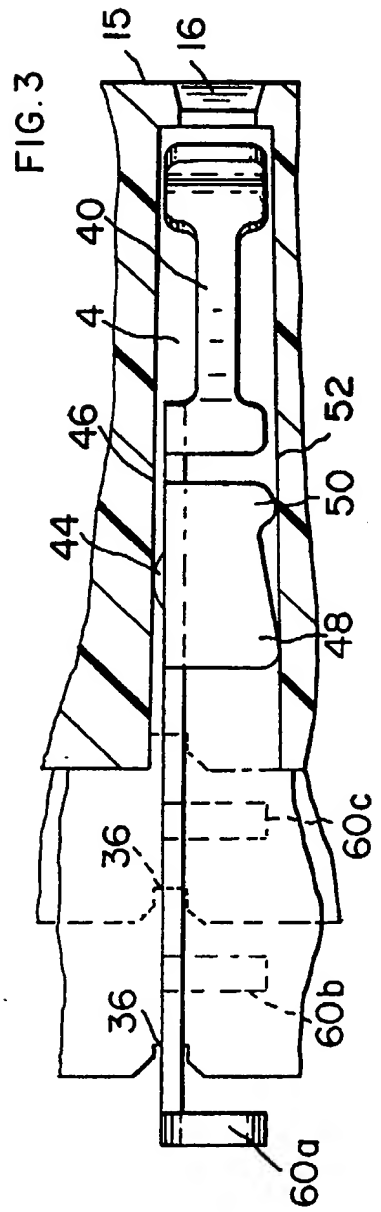
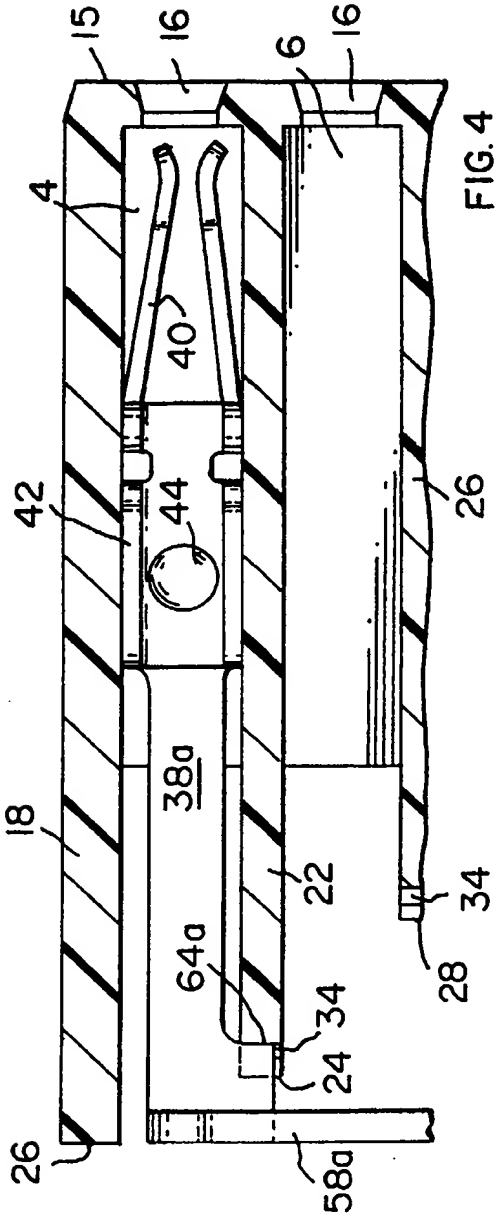

15
16
40
4
46
52
50
44
48
60c
36
36
60b
60a

FIG. 4


15
16
6
16
4
40
42
44
26
38a
18
22
34
64a
28
34
24
26
58a

2168550

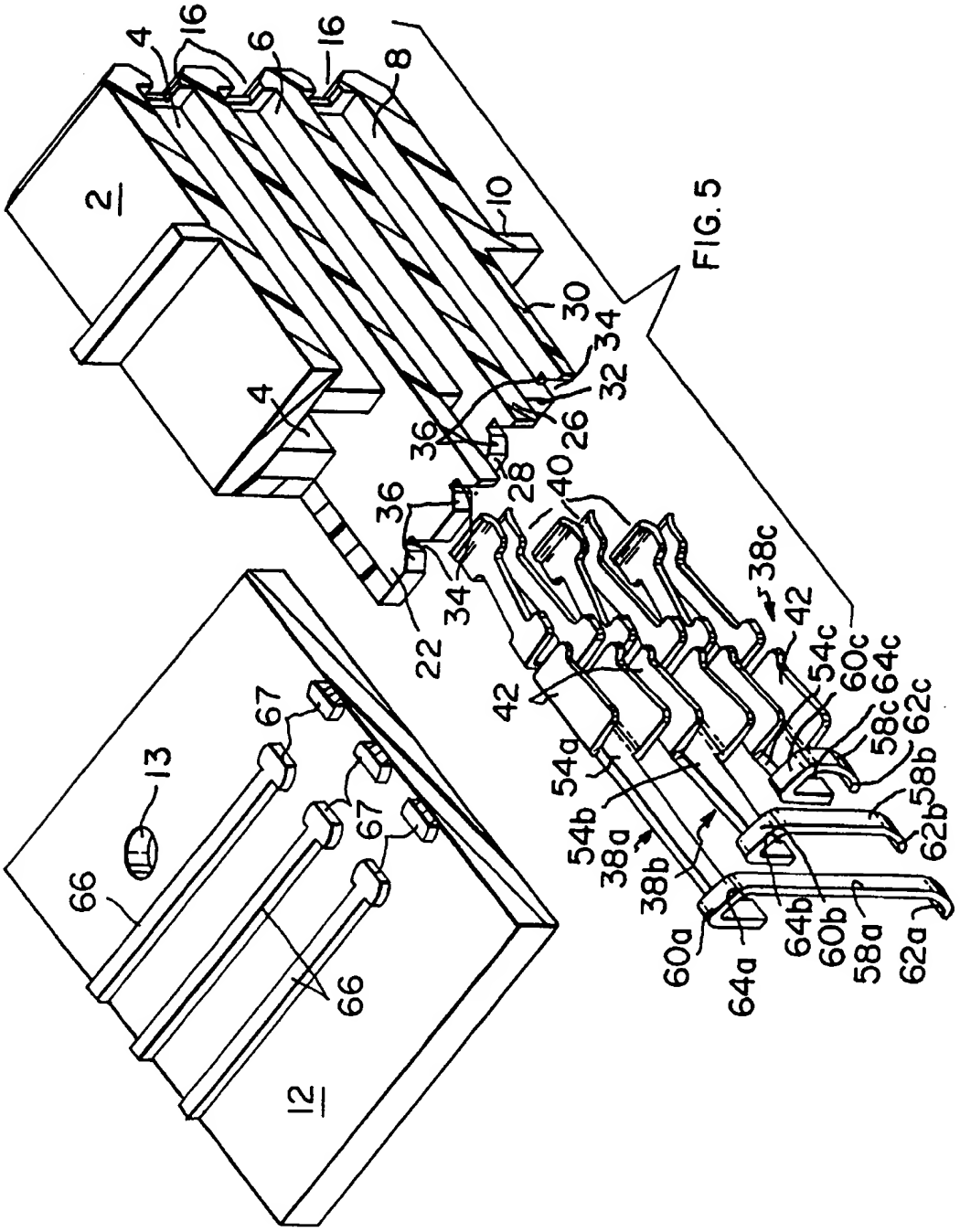


FIG. 5

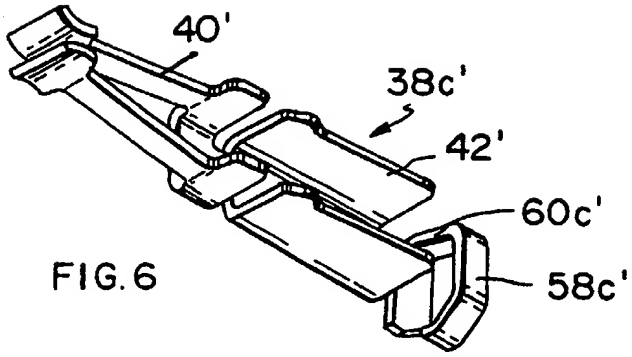


FIG.6

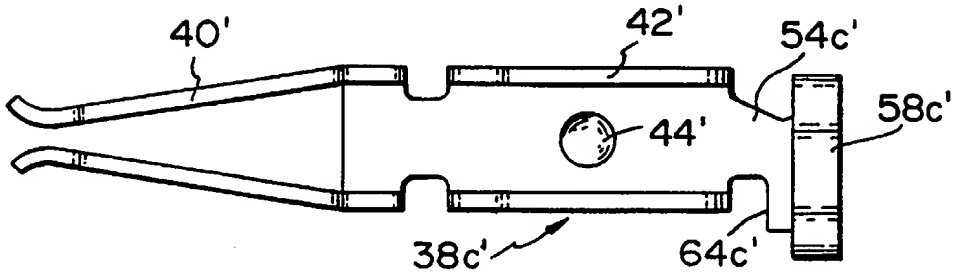


FIG.7

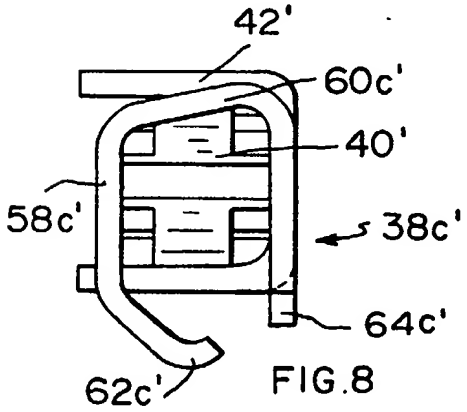


FIG.8

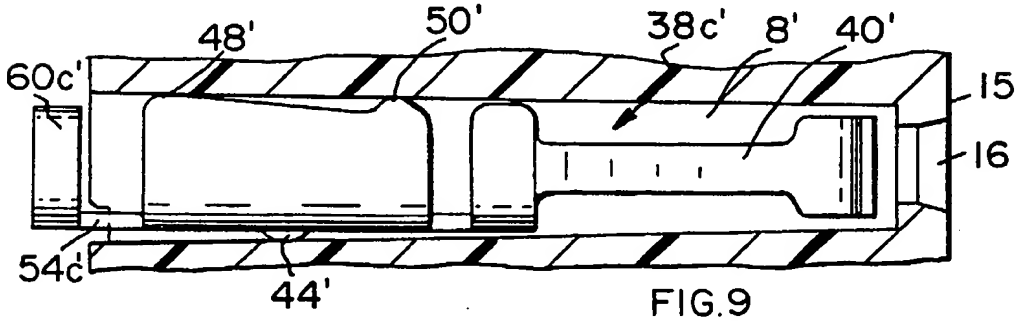


FIG.9

SPECIFICATION

An electrical c nnector and an electrical terminal

This invention relates to an electrical connector for connecting the conductors of a circuit board to external circuitry through terminals of the connector which have portions for soldering to the conductors. The invention also relates to an electrical terminal which is suitable for use in such a connector.

Since circuit boards are susceptible to warping, and are in any event not produced to close tolerances, at least for ordinary commercial use, for example in motor vehicles, the surfaces of the conductors to which the terminals are to be soldered are usually uneven so that the problem arises of ensuring that each terminal of the connector makes proper contact with the corresponding conductor of the board over a range of tolerances, both before and during the soldering operations.

According to one aspect of the invention, an electrical connector comprises an insulating housing defining superposed rows of elongate cavities each receiving an external electrical terminal having a first portion in the cavity for connection to an external electrical circuit and a compliant second portion depending from the cavity transversely of the length thereof and having a solder foot adapted to be soldered to a conductor on the circuit board, the feet of said second portions being substantially coplanar and being arranged in rows which are spaced from one another.

According to another aspect of the invention, an electrical connector comprises an insulating housing defining superposed rows of parallel elongate cavities each receiving an electrical terminal, the housing being mounted on a face of a circuit board, which face has thereon at least one row of conductors, each terminal having a first portion in the cavity for mating with an electrical contact member, and a second portion in the form of a compliant lead depending from the cavity and being adapted to be soldered to one of said conductors, the leads being connected to the first portions in such a way that each lead of the terminals received in each row of cavities engages a different one of said conductors and so that the leads are arranged in spaced rows.

When the connector is mounted to the circuit board, each second portion will firmly engage its conductor, both before and during soldering, regardless of irregularities in the surface of the board upon which the connector is mounted. The arrangement of the second portions in rows, facilitates access to the solder connections where a faulty terminal needs to be r placed.

Although if such access is to be achieved, the terminals must not completely be enclosed by the housing, it can n vertheless readily be ensured, in designing th housing, that no parts of the terminals project therefrom.

Further to facilitate terminal exchange, it is preferable that each terminal be force fitted, rather than latched in its cavity, the terminal being withdrawable through an open side of the housing.

The compliancy of the leads protects the soldered joints between the leads and the conductors from stresses arising during the use of the connector.

According to a further aspect of the invention, an electrical terminal comprises a portion for mating with a complimentary electrical contact member, a mounting portion connected to the mating portion, for securing the terminal in a cavity in an electrical connector housing, an arm connected to the mounting portion, and a compliant lead connected to the arm and extending transversely thereof at a position remote from the mounting portion and having a free end part in the form of a solder foot.

The length of the arm and of the compliant strip can readily be dimensioned according to the position of the cavity in which the terminal is to be located, in relation to the conductor bearing surface of the circuit board.

For a better understanding of the invention and to show how it may be carried into effect reference will now be made by way of example to the accompanying drawings in which:

FIGURE 1 is a perspective view of a right angle electrical connector mounted on a printed circuit board;

FIGURE 2 is an enlarged, fragmentary, perspective view, shown partly in section, illustrating details of the connector shown in Figure 1;

FIGURE 3 is a sectional view taken on the lines 3-3 of Figure 2;

FIGURE 4 is a partial sectional view taken on the lines 4-4 of Figure 1;

FIGURE 5 is an exploded view of Figure 2:

FIGURE 6 is a perspective view illustrating a modified form of an electrical terminal of the connector;

FIGURE 7 is an enlarged plan view of the terminal shown in Figure 6;

FIGURE 8 is an end view of the terminal shown in Figures 6 and 7; and

FIGURE 9 is a sectional view illustrating the terminal shown in Figures 6 to 8 mounted in a cavity in the housing of the connector.

The connector comprises an insulating housing 2 defining three parallel, superposed rows of terminal receiving elongate cavities 4, 6 and 8, respectively. The housing 2 has transverse ribs 10, one of which is used, as sh wn in Figures 1 and 2 for locating the housing 2 with resp ct to a printed circuit board 12 having an upper surface on which are elongate conductors 66 each terminating a

pad 67, the housing being secured to said surface of the board 12 by m ans of fasteners 14 passed through lugs (only one of which is shown) projecting laterally from the housing 2, and through holes 13 in the board 12. The other rib 10 can be used for locating the housing with respect to some other supporting surface (not shown).

The housing 2 has a mating face 15 formed with plug receiving openings 16 each communicating with one end of a respective one of the cavities 4, 6 and 8. Each cavity 4 tapers slightly in width in the direction of the respective opening 16 as shown in Figure 3. The cavities 6 and 8 are similarly tapered. The cavities are, however, all of constant height as shown in respect of the cavity 4, in Figure 4. The upper (as seen in Figures 1 and 4) wall of a each cavity 4 is provided, towards the left hand (as seen in Figures 1 and 4) end of the housing 2, that is to say its rear end, by a ledge 18 projecting from that face 20 of the housing 2 which is opposite to the mating face 15. The lower wall 22 of each cavity 4 terminates in a face 24 which is spaced back from the free edge 26 of the ledge 18, in the direction of the respective opening 16, the lower wall of each cavity 6 terminating in a face 28 which is spaced back from the face 24 in the direction of the respective opening 16. The lower wall 30 of each cavity 8 terminates in a face 32 which is spaced back from the face 28 in the direction of the respective opening 16, as shown in Figure 5. The end face of lower wall of each cavity is formed with a notch 34 each notch 34 having a flared guiding mouth 36.

Electrical terminals 38a, 38b, and 38c are received in the cavities 4, 6 and 8 respectively. Each terminal 38a, 38b and 38c comprises a receptacle portion 40 for receiving a plug terminal (not shown) inserted through the respective opening 16, and a mounting portion 42 of substantially U-shaped cross section, the base of the U being formed with a boss 34 engaging one sidewall 46 of the respective cavity (Figure 3), and the free edges of the arms of the U being formed with lobes 48 and 50 engaging the other sidewall 52 of the respective cavity, as exemplified by Figure 3.

Projecting from the base of the portion 42 of each terminal 38a, in the axial direction of the terminal, and away from its portion 40, is a rectilinear arm 54a which terminates in a substantially C-shaped compliant lead comprising a resilient strip, resiliently connected to the arm 54a by a web 60a extending transversely of the arm 54a, the strip 58a depending substantially at right angles from that end of the web 60a which is remote from the arm 54a and terminating in a solder foot 62a bent out slightly from the plane of the strip 58a. Proximate to the web 60a, the arm 54a is formed with a shoulder 64a facing towards the portion 42.

The terminal 38b has, xtending from the base of its portion 42, a rectilinear arm 54b similar to the arm 38a but being shorter, the arm 54b terminating in a substantially C-shaped compliant lead comprising a web 60b similar to the web 60a from which depends transversely of the arm 38a a resilient strip 58b similar to the strip 58a but being somewhat shorter, the strip 58b terminating in a solder foot 62b similar to the solder foot 62a. The arm 54b is provided with a shoulder 64b proximate to the web 60b, similar to the shoulder 64a.

The terminal 38c has a rudimentary substantially rectilinear arm 54c extending from the base of its portion 42 and being shorter than the arm 54b. The arm 54c is provided at its free end with a substantially C-shaped, compliant lead comprising a web 60c similar to the webs 60a and 60b, and from which depends a resilient strip 58c similar to the strip 58b but being shorter, the arm 58c terminating in a solder foot 62c similar to the feet 62a and 62b.

As best seen in Figure 2, the compliant leads described above depend from the cavities 4, 6 and 8 transversely of the lengths thereof and substantially at right angles thereto.

The terminals 38a, 38b and 38c are substantially identical excepting for the lengths of their arms 38a to 38c and of their resilient strips 58a to 58c. The feet 62a, 62b and 62c all lie substantially in the same plane: As best seen in Figure 2, the terminals in the rows of cavities, 4, 6 and 8 are so constructed that the strips 58a, 58b and 58c and their feet 62a, 62b and 62c are arranged in rows spaced from one another lengthwise of the cavities 4, 6 and 8, the feet all being substantially in the same plane.

The strips 58a form a first row remote from the ribs 10, and the strips 58b form a second row between the strips 58a and the strips 58c which form a third row nearest to the ribs 10. When the housing 2 has been mounted on the board 12, the feet of the strips in each row each engage a respective, individual, one of the pads 67 of the conductors 66.

With the connector assembled to the board 12 as described above, the feet 62a, 62b and 62c are soldered to the respective pads 67. Since the leads are compliant, contact is maintained between their feet 62a, 62b and 62c and the pads 67 over a wide range of tolerances, both before and during soldering, despite board warpage or other malformation. Further, since the rear side (that opposite to the mating face 15) of the housing 2 is open as best seen in Figure 2, a faulty terminal can easily be exchanged as ready access is thereby provided for applying a heat d bar to the soldering foot of the faulty terminal, and as the terminal can, when the foot has been

freed from its pad 67, be readily withdrawn manual y from its cavity in the housing 2 and removed through the open side ther of. A fresh terminal can then be introduced through said open side, pushed into the empty cavity and its soldering foot then so dered to the corresponding pad 67.

The mouths 36 of the notches 34 assist in guiding the shoulders 64a, 64b and 64c into their respective notches 34 and thereby assist the insertion of the terminals into the cavities. The withdrawal from, and insertion into, its cavity, of a terminal 38a, 38b or 38c, are readily achieved without the use of tooling, since the terminals are force fitted rather than latched into their cavities.

Figures 6 to 8 show a modified terminal 38c' the parts of which are referenced in the same way as in the above description in respect of the terminals 38c, but with the addition of a priime symbol to each reference. The terminal 38c' is identical with a terminal 38c, excepting that as will best be apparent from a comparison of Figures 3 and 9, which later Figure shows the terminal 38c' in a housing cavity 8', the web 60c' extends from the arm 54c' in the opposite direction to that in which the webs extend from the arms 54a, 54b, and 54c of the terminals 38a to 38c described above. The terminals 38a and 38b, could of course be modified according to the teaching of Figures 6 to 9.

In use of the connector 2, the receptacle portions 40 are mated with plugs of a mating connector (not shown), by inserting the plugs through the openings 16, thereby to connect an external circuit (not shown) to the conductors 66 on the board 12.

The resilience of the C-shaped leads protects the soldered joints between the solder feet and the pad 67 on the circuit board from stresses arising from thermal effects or from the action of mating the connector 2 with said mating connector.

The cavities in the housing may be arranged in only two rows or in more than three rows, the pads 67 being correspondingly arranged.

CLAIMS

1. An electrical connector comprising an insulating housing defining superposed rows of elongate cavities each receiving an electrical terminal having a first portion in the cavity for connection to an externa electrical circuit and a compliant second portion depending from the cavity transversely of the length thereof and having a solder foot adapted to be soldered to a conductor on a circuit board, the feet of said second portions being substantially coplanar and being arranged in rows which are spaced from ne another.

2. An electrical connector comprising an insulating housing defining superposed rows of parallel elongat cavities each receiving an electrical terminal, the housing being mounted on the face of a circuit board, which face has thereon at lease one row of conductors, each terminal having a first portion in the cavity, for mating with an electrical contact member and a second portion in the form of a compliant lead depending from the cavity and being adapted to be soldered to one of said conductors, the second portions being connected to the first portions in such a way that each lead of the terminals received in each row of cavities engages a different one of said conductors and so that the leads are arranged in spaced rows.

3. A connector as claimed in claim 1 or 2, in which the rows of cavities are at east three in number, the second portion of each terminal being connected to the first portion thereof by way of an arm extending axially of the cavity in which the terminal is received, the arms and the second portions of the terminals progressively varying in length from row to row.

4. A connector as claimed in claim 3, in which each second portion comprises a resilient strip connected to said arm by a web extending transversely of the length of the arm.

5. A connector as claimed in any one of the preceding claims, in which the termina s are force fitted into the cavities and are withdrawable therefrom through an open side of the housing.

6. A connector as claimed in claim 5, in which the terminals are axially located in the cavities by means of shoulders proximate to the second portions of the terminals. The shoulders engaging in notches formed in end faces of walls of the cavities and opening towards said open side of the housing.

7. A connector as claimed in any one of the preceding claims, in which the second portions are arcuate, being substantially C-shaped.

8. An electrical terminal comprising a portion for mating with a complimentary electrical contact member, a mounting portion connected to the mating portion, for securing the terminal in a cavity in an e ectrical connector housing, an arm connected to the mounting portion, and a compliant lead connected to the arm and extending transversely thereof, at a position remote from the mounting portion and having a free end part in the form of a solder foot.

9. A terminal as claimed in claim 8, in which the lead is arcuate, being substantially C-shaped.

10. A terminal as claimed in claim 8 or 9, in which the lead comprises a resilient strip connected to the arm by way of a resilient web proximate to a fr e end of the arm.

11. A terminal as claimed in claim 10, in which the arm is provided with a shoulder proximate to its free nd, the shoulder facing towards the mounting portion.

12. A terminal as claimed in any one of claims 8 to 11, the terminal being substantially rectilinear between the lead and the mating p rtion.

13. A terminal according to any one of claims 8 to 12, in which the mounting portion is substantially U-shaped, the base of the U being formed with a boss projecting from its outer surface, and the free edges of the arms of the U being formed with lobes projecting away from said base.

14. An electrical connector substantially as hereinbefore described with reference to the accompanying drawings.

15. An electrical terminal substantially as hereinbefore described with reference to the accompanying drawings.

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